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All the fragments found seem to be of local rock, though eye witnesses state that they reached the ground in a partially incandescent state. Dr. Hector concludes the eruption to have been a purely hydro-thermal phenomenon on a gigantic scale, but quite local in character.

AFRICA.—*African News*.—Lieut. E. Gleeup, a Swede in the service of the Congo Free State, has recently crossed Africa from the Congo to Zanzibar. He had been left for nearly a year without supplies at the remote station at the seventh cataract of the Stanley falls, and finally left for Europe by the aid of funds furnished by Tippoo Sib, the rich Arab trader. The journey to the east coast occupied six months.—Reports by the late Sir P. Scratchley, British Special Commissioner to New Guinea, gives a description of the characteristics of the natives of different portions of the coast of British New Guinea. The littoral seems to be well inhabited, except some portions of the north-east coast. Two rivers, the Davadava and Hadava were discovered in Milne bay, the latter river a large one.—Dr. Paulitschke writes, in the Mittheilungen of the Geographical Society of Vienna, upon the two hydrographic problems of the Somali peninsula, that of the Upper Webi, and that of the Juba. He believes that we must seek the source of the Webi in one of the lakes of Gurage.

#### GEOLOGY AND PALÆONTOLOGY.

NOTICE OF GEOLOGICAL INVESTIGATIONS ALONG THE EASTERN SHORE OF LAKE CHAMPLAIN MADE BY PROFESSOR H. M. SEELY AND PREST. EZRA BRAINARD.—In this paper is announced the discovery of quite an extensive new fauna in limestones, apparently of the age of the Birdseye limestone of the New York series, near the mouth of the Otter creek, Lake Champlain, which is of much interest owing to the fact that only about fifteen species of fossils have hitherto been known from the formation. The new forms described in the paper from this one bed are fifteen in number, comprising one Brachiopod, six Gasteropods and nine Cephalopods. One of the Gasteropods has given reasons for the establishment of a new genus, *Lophospira*, with *Murchisonia bicincta* Hall, and *M. helicteres* Salter, as the types. The bed of limestone in question is associated in the vicinity with recognized Chazy, Birdseye and Black River limestones, and holds a position considerably above the Maclurea beds of the Chazy close by. A close comparison of the fossils shows a much nearer relation with the form of the Birdseye and Black River than with the Chazy; the known species being principally from the Birdseye. *Orthocras bilineatum* Hall, *Maclurea affinis* Billings and *M. logani* Murch., *Asaphus canalis* Conrad, *Bathyrurus extans* Hall, *Harpes ottawaensis* Billings and *Illæma crassicauda* (Wahl.) Hall. The *Asaphus* is known in the Chazy as well as in the Birdseye, and

the Harpes was described originally from the Trenton. About the specific identity of the latter there is yet some doubt.

Besides the fossils already mentioned, the paper also includes descriptions of another new genus of gasteropod—*Calaurops* (a shepherd's crook), for a form collected in a bed some twenty-five or thirty feet below and just above the *Maclurea* bed, having the form of a *Euomphalus* in the inner coils, but afterward becoming deflected in a straight line to the extent of six inches. Also two *Trilobites* and a *Cyrtoceras* from the Birdseye of Isle La Motti.

Since the meeting at Buffalo and during the week previous, the author of the paper, in conjunction with the persons named in the title of the paper, have made other collections at the same locality, which has resulted in the discovery and determination of several other species, the descriptions of which are nearly ready for the press, and illustrations of them for the engraver. The fauna of the Birdseye limestone at that locality is known now to consist of the following group of fossils :

Genus *Orthis* 1 species, resembling *O. perveta* Con.

<i>Streptorhynchus</i>	1	"	new.
<i>Leptaena</i>	1	"	"
<i>Triplesia</i> ?	1	"	?
<i>Maclurea</i>	2	"	<i>affinis</i> and <i>logani</i> .
<i>Euomphalus</i>	1	"	new.
<i>Helicotorna</i> ?	1	"	"
<i>Holopea</i>	2	"	"
<i>Subulites</i> ?	1	"	"
<i>Murchisonia</i>	2	"	"
"	1	"	<i>gracilis</i> Hall ?
<i>Lophospira</i>	1	"	new.
<i>Clisospira</i>	1	"	"
<i>Ecculiomphalus</i>	1	"	"
<i>Tryblidium</i> ?	or a new genus, 3 species, new.		
<i>Bellerophon</i>	1	species, new.	
<i>Orthoceras</i>	2	"	"
"	1	"	<i>bilineatum</i> Hall.
"	1	"	?
<i>Piloceras</i>	1	"	new.
<i>Gomphoceras</i>	2	"	"
<i>Cyrtoceras</i>	2	"	"
<i>Nautilus</i>	2	"	"
<i>Lituities</i>	3	"	"

Crustacea :

Genus *Ribiera* 1 species, new.

*Asaphus canalis* Conrad.

*Bathyurus extans* Hall.

*Harpes ottawaensis* Billings ?

*Amphion* 1 species, new.

Giving a total of forty recognized species in a condition suita-

ble for description and illustration, of which the new ones are shortly to appear in a Bulletin of the Am. Mus. Natural History, with a description of the geology of the region by Professors Seely and Brainard.—*R. P. Whitfield.*

THE VEINS OF SOUTHWESTERN COLORADO.<sup>1</sup>—It is quite impossible to thoroughly understand the complicated vein-structure of the San Juan region without an intimate knowledge of the geological history. The details of the stratigraphy are very interesting, but we cannot stop to review them here. Suffice it to say that the succession of the strata, aside from local features of little importance for our present purpose, is much the same as in typical sections from the Rocky mountains through Wyoming and Northern Colorado.

The real vein-history begins with the close of the Cretaceous age, when the great folds took place which afterwards became the seat of volcanic action. I must refer to the previous papers read at this meeting of the Association for much of what might properly be brought into discussion here, and we may at once proceed to a brief description of the veins and their arrangement.

In the period of the andesitic outflows the country comprising the great San Juan Central area was so situated that the lavas did not cover it, and much of this material did not reach the surface, but it was forced in between the limestone and other rocks as intrusive masses. The general course of the fissures was along the primary longitudinal folds (N. 18° E.), and the veins were produced in fault crevices. Owing to the greater age of the deposits and their frequent intrusive character, there is considerable variety in the mineral contents and in the cross-sections of the veins. The earliest appear to be those of the La Plata district, with those of the Rico tract and the Summit district originating, perhaps, somewhat later. The first named are characterized by the abundance of gold, both free and in tellurides and similar compounds; the Rico area is peculiar from its close relationship to the Carboniferous limestones, resulting in the formation of carbonated ores, though in other respects this belt is very near the La Plata tract in its genesis; the Summit district is widely separated from these two basins, and has been the seat of much secondary action, so that the date of its initial stages in vein-formation is difficult to determine, but with results similar to those of the latest epoch. I am strongly of the opinion that the genesis was but little, if any, later than that of the other two sets.

In the Central San Juan area the complexity is very great, and yet the distribution of the veins may be brought into order in a beautiful system with surprising regularity in the grouping. There are six radial zones passing out from Red peak (the geyser

<sup>1</sup> Paper read before Section E, A. A. A. S., Buffalo, 1886.

basin described at the Buffalo meeting in another paper) and extending as far as the confines of a depressed area which was caused by faulting in the trachytic period. These zones are traversed by central, nearly vertical veins ("parent fissures," as I have elsewhere styled them), bounded upon each side by veins converging laterally and from above downwards. The mid-ribs are free-gold bearing, and they represent three trends intersecting near Red peak. These trends are about N. 80° E., N. 38° E. and N. 38° W. The zones vary in width, but between each two there is a barren belt of greater or less breadth. Beginning at the north we have (1) the *arsenical* zone, characterized by minerals carrying high percentages of arsenic; (2) the *bismuth* zone; (3) the *galena-gray copper* zone; (4) the *antimonial* zone, practically the prolongation south-westward of the arsenical wedge; (5) the *argentiferous-galena* zone, opposite the bismuth wedge, and (6) the *sulphuret* zone, a wide area with few veins, but these rich and carrying true silver minerals (sulphides) largely.

The faults and the vein-filling appear to have occurred subsequently to the trachytic ejections but prior to the rhyolitic period. The evidence is that the gradual elevation of the Red peak focus caused the subsidence and faulting along the edges and across two of the three stated radii of the depressed area, but that the deposition of the veins along the arsenical-antimonial trend was later than the rhyolitic period, or in its closing stages. After this the veins of the Red Mountain area were much modified by the secondary action of hot springs and geysers.

I have given here the mere outline of the facts, and but a small part of what has been put into other publications, but minute details can not be presented in this place.

It is, however, important to note that much material has been collected bearing more or less directly upon the source of the vein-stuff, and that the conclusion is imperative that local segregation from the volcanic rocks is wholly untenable. The idea that the veins in the volcanics have been derived from preëxisting ore-deposits in the subjacent metamorphics is quite as wide of the facts, and there can be no doubt of the deep-seated origin of the lodes at a period coincident with the igneous action.—*T. B. Comstock.*

A GIANT ARMADILLO FROM THE MIOCENE OF KANSAS.—The museum of the University of Kansas, at Lawrence, contains a portion of the dermal skeleton of an armadillo, probably of the family Glyptodontidæ, from the Loup Fork formation of that State. I owe the opportunity of examining and describing it to my friend, Professor Francis Snow, of that institution. The species appears to belong to a genus distinct from those known to belong to the Glyptodontidæ, which I shall call *Caryoderma*. Its peculiarity consists in the fact that a portion of the carapace

is represented by osseous nuclei only, which do not articulate with each other. The scuta belonging to the tail are distinct from each other, and not coössified as in *Dædicurus*. The species may be named and described as follows:

*Caryoderma snovianum* Cope, sp. nov.—The dermal scuta may be arranged in four classes. First, the smallest, which are subquadrate in outline, and flat; one of the flat faces, probably the internal, smaller than the opposite one, and more spongy. Six of these; the largest  $15^{\text{mm}}$  in width. Second, larger scuta, subhexagonal or pentagonal, or oval, with the dense smooth external face rising towards and produced beyond one of the borders of the base as a flat more or less angular cornice. This cornice is separated from the border of the basal part of the bone by a rabbet or open groove. Inferior surface perforated by foramina. Edges finely rugose. Of this type there are seven scuta. Dimensions of largest, length  $32^{\text{mm}}$ , width  $35^{\text{mm}}$ . The third type resembles the second, but the cornice is represented by a conical elevation which does not project beyond the edge of the base, but stands above or within it. Inferior surface more or less concave. Size of largest, length  $40^{\text{mm}}$ , width  $33^{\text{mm}}$ ; of smallest,  $15^{\text{mm}}$  by  $14^{\text{mm}}$ . Four large and three small. The fourth kind of dermal bone is an acute cone with a small convex base, more or less obliquely truncated. Four of these, two large and two small. Measurements of former, base  $28^{\text{mm}}$  by  $22^{\text{mm}}$ , total elevation  $32^{\text{mm}}$ ; measurement of smaller kind, base  $15^{\text{mm}}$  by  $11^{\text{mm}}$ , total elevation  $22^{\text{mm}}$ .

It is probable that the third kind of plate belongs to the tail, where they enter into the composition of the annuli, as in *Glyptodon* and *Hoplophorus*. Processes resembling the fourth kind are found on the superior middle line of the tail in *Hoplophorus*, and also along the inferior edge of the carapace.

An ungual phalange is of interesting form. It is hoof-like, longer than wide, and squarely truncate at the extremity without notch. The superior surface is convex in transverse section, and straight in profile, which rises behind. The inferior face is flat for the distal two-thirds; the proximal two-thirds rising to the articular surface. The latter is not wider than the distal extremity, the surface expanding and forming a shoulder one-quarter the length distad of it. Articular surface concave vertically, a little convex transversely. Total length of phalange  $32^{\text{mm}}$ , greatest width  $24^{\text{mm}}$ , greatest depth  $17^{\text{mm}}$ ; width of extremity  $14^{\text{mm}}$ ; of articular facet  $15^{\text{mm}}$ .

The discovery of this form in the Loup Fork bed of Kansas is of much interest on several accounts. First, it is the first time this group of Edentata has been discovered north of the valley of Mexico. Secondly, as belonging to an earlier epoch than the Pampean *Glyptodontidæ* of South America, *Caryoderma* stands in the position of ancestor. Thirdly, the rudimental character

of some of the segments of the carapace shows the latter to have been undeveloped, which is further consistent with a relation ancestral to the other armadillos. It is probably a case of persistence, however, for since the Miocene beds of the Parana have been shown by Ameghino to contain ancestral Glyptodontidæ, the North American ancestors of these are to be sought in beds earlier than the Loup Fork. The species was discovered by Mr. Charles H. Sternberg, in Northern Kansas. It is respectfully dedicated to Professor F. H. Snow, of the university of that State.

GEOLOGICAL NEWS.—*General*.—In these days of earthquake theories that of M. De Montessus (Rev. Scient., 1886, 369) is worthy of notice. He starts by enumerating the three chief theories of the constitution of the earth: (1) A central fluid nucleus with a more or less thick crust; (2) a central solid nucleus and a solid crust separated by a spherical liquid ring; (3) a solid interior with chambers filled with fluid. Postulating the correctness of the first theory, which prevails in France and holds its own in other countries, he then gives, as the result of calculations made upon 4943 shocks, the statement that earthquakes are more frequent when the moon is on the meridian than when it is at right angles with it. From this he passes to the fact that were the ocean composed of a dense fluid, like mercury, the tides would consist of an actual transport of matter following the moon's course. May not such tides take place below the earth's crust? Capt. Boulanger, in 1880, dared to doubt that the earth moved as a whole, so that the velocity of every point is proportional to its distance from the center. The patient study of the sun spots has proved that there is in the sun's matter an internal and external circulation quite different from that which would result from a rotation in every point proportionate to the radius. Vortex motions, according to M. Faye's law, must be produced in fluids the layers of which are in movement with slightly differing velocities. Add these vortex movements to the subterranean lunar tides, and M. Montessus' earthquake theory is outlined.

*Palæozoic*.—Professor Ed. Hull, Mr. Mellard Reade and others in Britain, with Mr. Crosby in America, maintain that in Palæozoic times the North Atlantic and the North American continent in the main changed places. In the words of the first of these: "If it be allowed as a general principle that the originating lands lay in the direction towards which the sediments thicken, and opposite to that in which the limestones are most developed, the conclusion is inevitable that the Atlantic was, in the main, a land surface in Palæozoic times."

*Permian*.—M. Alb. Gaudry describes *Haplodus baylei*, a reptile from the Permian beds of Telots, near Autun (France). The name is derived from Greek words which signify the close adhesion of the teeth to the maxillaries. Three other types of rep-

tiles, Actinodon, Protriton and Stereorachis, are now known from these beds.

*Secondary.*—The central region of Tunis, according to M. Rolland, consists in great part of a mass of senonian beds with limestones yielding inocerami and cephalopods. This mass is here and there capped by nummulitic beds. These beds are found all around the Mediterranean region, but those of Algiers and Tunis are characterized by peculiar species.—M. Thomas has discovered beds of phosphate of lime in Tunis. In the south-west are rich and very extensive Eocene deposits, while near Feriana there is a small bed of Cretaceous age. In the Albian marls of Constantine, in Algeria, there are notable Cretaceous beds of this mineral.

*Quaternary.*—M. Reviere, who at the meeting of the French Assoc. Adv. Sci. at Grenoble, in 1885, gave a list of 171 shells discovered in the grottoes of Meudon, has this year described the fishes and birds. The few fishes found are principally those of fresh water, which seems inexplicable among peoples living on the shore of a sea so rich in fishes as the Mediterranean. The vertebra of a salmon, a fish of the northern rivers, was found, and speaks of the migrations of these Quaternary peoples.

#### MINERALOGY AND PETROGRAPHY.<sup>1</sup>

NEW BOOKS.—The third part of Professor von Gümbel's "*Geologie von Bayern*"<sup>2</sup> has just been received. Although not yet completed, enough of the first volume has already appeared to show that the work in its entirety will fill a long felt want. In this volume the author proposes to set forth the principles of geology as generally accepted at the present time, devoting quite a considerable portion of the book to the microscopical characteristics of rocks, and to the truths which the microscope reveals, as well as to the theories to which the use of this instrument has given rise. That portion of the book which has already appeared is well illustrated by nearly four hundred photo-engravings. Most of these illustrations are taken from localities in Bavaria. The author, however, has not hesitated to draw on any source that would serve his purposes better than those at hand in his own country. The result is a most satisfactory text-book of geology, in which all the most modern methods of geological research are described, and the results to which each leads carefully given. The subject of metamorphism has received considerable attention and also the theories relating to "petrogenesis," or the origin of rocks. The second volume will be devoted to a description of the geology of Bavaria.—The first of a series of monographs on edu-

<sup>1</sup> Edited by Dr. W. S. BAYLEY, Madison, Wisconsin.

<sup>2</sup> *Geologie von Bayern.* Bd. I, Lief. I, II, III, Grundzüge der Geologie. Dr. K. W. von Gümbel. Cassel, 1884-6.